

PROCEDURE 4 - Control of Hazardous Energy Sources

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Synopsis

The purpose of this procedure is to provide requirements related to hazards associated with the unexpected energizing or start up of machines or equipment or the release of stored energy (mechanical, electrical, gravitational). This procedure applies to all NWS equipment, facilities, work locations, and employees.

Initial Implementation Requirements:

- **Analyze Site Operations versus Requirements of the Procedure**
 - Identify Equipment/Systems requiring Lockout/Tagout Procedures. (4.3.3, Attachment A)
- **Develop/Obtain Documentation/Information required for Site**
 - Develop Lockout/Tagout procedure for applicable equipment/systems. (4.3.3)
- **Designate Person to Administer Control of Hazardous Energy Sources Procedure Requirements**
- **Provide Local Training of Site Personnel**
 - Training/Certification of authorized personnel. (4.3.4a)
 - Safety Observer Training. (4.3.4i)
 - Awareness Training for all employees. (3.3.4c,d)
- **Inventory Material/Equipment (Procure as required)**
 - Lockout/Tagout Devices. (4.4.2b, 4.3.2)
 - Personal Protective Equipment (PPE). (4.4.2b, 4.3.1a(2)(c))

Recurring and Annual Task Requirements:

- **Review/Update Documentation/Information required for Site**
 - Update Lockout/Tagout Procedures. (4.3.3)
 - Maintain a log of all Lockout/Tagout procedures. (4.3.1g(11))
 - Maintain Training Records. (4.3.4h)
- **Provide Refresher Training of Site Personnel (If Applicable)**
 - Change in Equipment & Job Assignment Training. (4.3.4e,f)
- **Inspect/Replace/Maintain Material/Equipment**
 - Lockout/Tagout Devices. (4.4.2b, 4.3.2)
 - Personal Protective Equipment (PPE). (4.4.2b, 4.3.1a(2)(c))

Control of Hazardous Energy Sources Checklist

REQUIREMENTS	EHB 15 Reference	YES	NO	N/A	Comments
Is initial and annual review of this procedure conducted and documented?	5.4.2				
Have procedures been developed for properly locking out/ tagging out equipment/systems?	4.3.3 Attachment A				
Are Lockout/Tagout procedures reviewed at least annually?	4.4.2a				
Are all Lockout locks standardized and used only for Lockout purposes?	4.3.2a				
Are Lockout Devices used along with tags?	4.3.1c				
Has all equipment regularly maintained been modified to accommodate Lockout Device?	4.3.1d				
Do the tags have the name of person installing the lock and the date the lock was installed legibly printed on the lock?	4.3.2a, 4.3.1f				
Are tags affixed to Lockout or energy isolation devices by a means of a strong fastening device?	4.3.2b				
Are Lockout/Tagout devices removed by personnel who applied the device or their designated representative?	4.3.2c				

REQUIREMENTS	EHB 15 Reference	YE S	NO	N/A	Comments
If more than one individual is required to work on piece of equipment, are multiple lockout devices used?	4.3.1g(8)				
Is NWS employee being designated to install additional lockout device when a contractor is performing work requiring use of such device?	4.3.1g(9)				
Have employees that perform Lockout/Tagout been properly trained?	4.3.4a				
Have affected employees been instructed on the purpose of Lockout/Tagout?	4.3.4b				
Are employees retrained when changes in equipment, job assignment or Lockout/Tagout procedures occur?	4.3.4e				
Is Safety Observer Training conducted?	4.3.4i				
Are Training Certificates kept on file?	4.3.4h, Attachment C				

4 CONTROL OF HAZARDOUS ENERGY SOURCES

4.1 Purpose and Scope

As part of its goal to provide a safe and healthful workplace, the National Weather Service (NWS) is promulgating this procedure relative to hazards associated with the unexpected energizing or start up of machines or equipment or the release of stored energy (mechanical, electrical, gravitational). This procedure applies to all NWS facilities, work locations, and employees.

4.2 Definitions

Affected Employee. An employee who, in the performance of their official duties, is required: to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or to work in an area in which such servicing or maintenance is being performed.

Authorized Employee. A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include servicing or performing maintenance as covered under this procedure.

Capable of Being Locked Out. An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which a lock can be affixed or if it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out if lockout can be achieved without the need to dismantle, rebuild or replace the energy isolating device or permanently alter its energy control capability.

Energized. Connected to an energy source or containing residual or stored energy.

Energy-Isolating Device. A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a line valve; a block and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit-type devices of the momentary contact type are not energy-isolating devices.

Energy Source. Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other energy.

Field Office. A Field Office may include the following: Weather Forecast Office (WFO), River Forecast Center (RFC), Weather Service Office (WSO), and a Data Collection Office (DCO).

Hot Tap. A procedure used in the repair, maintenance, and service activities that involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or additions. A hot tap is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam and petrochemical distribution systems.

Hot-work. For the purpose of this procedure this term will refer to performing work on or in the direct vicinity of unprotected/un-insulated energized electrical conductors or components.

Jogging or Cycling. A procedure in which the energy-isolating device is temporarily removed to allow the equipment/component to be energized for testing and/or positioning purposes.

Lockout. The placement of a lockout device on an energy-isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout Device. A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Lockout devices include blank flanges and bolted slip blinds.

Normal Production Operations. The use of machinery or equipment to perform their intended work function(s).

Operating Unit. For the purpose of this procedure, Operating Unit includes the National Centers for Environmental Prediction (NCEP), National Data Buoy Center (NDBC), NWS Training Center (NWSTC), National Reconditioning Center (NRC), Radar Operations Center (ROC), or the Sterling Research & Development Center (SR&DC).

Servicing and/or Maintenance. Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energizing or startup of the equipment or release of hazardous energy.

Setting Up. Any work performed to prepare machinery or equipment to perform its normal work operation.

Station Manager. For the purpose of this procedure, the Station Manager shall be either the NWS Regional Director; Directors of Centers under NCEP (Aviation Weather Center, NP6; Storm Prediction Center, NP7; and Tropical Prediction Center, NP8); Directors of the NDBC, NWSTC, and Chiefs of NRC, ROC and SR&DC facilities; or Meteorologist in Charge (MIC), Hydrologist in Charge (HIC), or Official in Charge (OIC).

Tagout. The placement of a tagout device on an energy isolating device following established procedure, to indicate that the energy isolating device and the equipment being controlled shall not be operated until the tagout device is removed by the individual who tagged the device or by his/her designated safety representative.

Tagout Device. A prominent warning device such as a tag and a means of attachment which can be securely fastened to an energy isolating device, following established procedure, to indicate that the energy isolating device and the equipment being controlled shall not be operated until the tagout device is removed by the individual (or his/her designated safety representative) who tagged the device.

4.3 Procedure

4.3.1 Control of Hazardous Energy. The following procedures shall be used whenever there is potential for personal harm due to the unexpected energizing or start-up of equipment or the release of stored energy:

a. This procedure does not cover the following:

- (1) Work on equipment that can be completely de-energized by being unplugged, if the plug is always in the sight and control of the immediately responsible, physically endangered person(s) and if there are no other hazards associated with the operation. Even then, it is recommended that the user tagout the equipment or use a plug lockout device.
- (2) Work on any electrical equipment that is to remain energized, if all of the following apply:
 - (a) The requirements and recommendations of the following publications are followed:
 - i National Electrical Code (NFPA 70)
 - ii National Electrical Safety Code (NESC) - ANSI/IEEEC2
 - iii OSHA 29 CFR Part 1910 Subpart S, Electrical
 - iv Standard for Electrical Safety Requirements for Employee Workplaces - NFPA 70E

NFPA 70E covers the following safety practices and procedures:

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- a. Clearances (working distances) while working on electrical equipment as shown in NEC Article 110-26 (based on operating voltages) shall be provided.
- b. Clothing made from synthetic materials such as acetate, nylon, polyester or rayon shall not be worn.
- c. Appropriate safety and personal protective equipment shall be worn while working on energized electrical equipment:

Protective eye goggles

Nonconductive hard hat

Insulated gloves

Protective shields
- d. No tampering with any electrical overcurrent devices shall be allowed.
- e. No conductive objects shall be taken closer to any live parts than the restricted approach boundary.
- f. Conductive articles such as jewelry, clothing, watchbands, bracelets, key chains and necklaces shall not be worn while working on energized equipment.
- g. Caution shall be used while handling metal ducts, pipes, conductive hoses, steel tapes, metal scaffold parts, etc.
- h. Insulated tools that are voltage rated for the equipment worked on shall be used.
- i. Portable ladders shall have nonconductive side rails.
- j. Protective measures shall be taken while being exposed to hazardous materials and gases in work area.

- k. Safety signs and accident prevention tags shall be used where necessary to warn personnel about the electrical hazards that might endanger them.
- l. Barrier tapes shall be used as necessary.
- (b) Continuity of service is essential.

NOTE: The Station Manager shall determine when continuity of service is essential.

- (c) Personal protective equipment is used such as high voltage gloves, bus blankets, insulated tools, etc.

NOTE: Hot work on an Uninterruptible Power System (UPS) will be performed following the same precautions used for live electrical equipment supplied power from the local utility lines or the back-up generator. Hot work activities do not differ based on types of power sources, therefore, the same precautions shall be followed.

- (3) Individuals performing minor tool changes and adjustments and/or other minor servicing activities that are routine, repetitive, and integral to the use of the equipment and that occur during normal work operations are not covered by this procedure, provided the work is performed using alternative measures that provide effective protection.
- b. Lockout locks and devices are the preferred method to isolate a potential hazard. They shall be used whenever:
 - (1) There is a hazard present that may cause personal harm by an inadvertent start-up or unexpected release of energy or toxic material.
 - (2) The equipment is capable of being locked out.
- c. Lockout locks shall always be accompanied by a tagout tag for identification purposes.
- d. All equipment that is regularly maintained, or which contains a high degree of hazard, should be modified to accommodate a lockout lock. New equipment procured after January 2, 1990, shall be capable of accommodating a lockout lock and/or lock device to which a lock can be attached.

- e. Tagout tags shall be used whenever:
 - (1) A lockout lock is used and/or.
 - (2) A hazard is present that may cause personal harm, and the equipment is not capable of being locked out. **If a tagout tag is used without a lockout lock, it is the responsibility of the user to provide an additional level of safety** to prevent release of the hazard(s).
Examples of such actions include removal of an isolating circuit element, blocking of a controlling switch, installing of a blind flange, bracing or cribbing an opening, opening of an extra disconnecting device or the removal of a valve handle to reduce the likelihood of an inadvertent release or energizing.
- f. Tagout devices shall be signed and dated (month and year) by the installer. The installer shall also write the expected tagout period, which includes date, time and location of the person(s) performing the tagout of the circuit(s) on the tag.
- g. Installation and removal of lockout and/or tagout devices shall be performed in the following order:
 - (1) The installer shall ensure that all affected employees are notified that service or maintenance is to be performed on the equipment or system and that lockout and or tagout devices will be installed.
 - (2) The equipment shall be shut down following the manufacturer's guidelines or by means of approved protocols established for the specific piece of equipment.
 - (3) All forms of energy supplied to the equipment and the necessary means to isolate the energy source(s) (e.g., primary and backup) shall be identified and lockout and tagout devices shall be installed.
 - (4) A lockout device(s) and tag(s) shall be placed on all energy isolation equipment or electrical circuits. If the lockout device is not capable of being locked, then a tag shall be affixed on or near the lockout device in such a manner that it is obvious which equipment or circuit the tag pertains to.

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- (5) All stored energy in the equipment or system shall be released or constrained by means of venting, discharging, bleeding, blocking or repositioning.
- (6) Once all sources of energy have been isolated and all stored energy is released or constrained, system controls will be tested to ensure that the system cannot activate or release stored energy. Once this test has been completed, controls shall be returned to the neutral or off position.
- (7) Once the above items have been accomplished, the maintenance or servicing of equipment can be performed.
 - (a) If a function test or “jogging” that requires the removal of a lockout or tagout device must be performed during the servicing or maintenance of the equipment, all affected employees shall be notified.
 - (b) Once the action requiring the energizing of the equipment has been completed, items 2 through 6 shall be completed again prior to work continuing.
- (8) If more than one individual is required to work on a piece of equipment, a multiple lockout device shall be used. Each individual working on the equipment shall install their own lock and tag.
- (9) If a contractor is performing work that requires a lockout/tagout in the area where other NWS employees are present, an NWS employee shall be designated to lock and/or tag the equipment in addition to the lockout/tagout device installed by the contractor. The NWS employee shall not remove his/her lockout/tagout device until the contractor has completed the work and removed their devices. This requirement does not apply to situations when contractors are working at the remote site by themselves.
- (10) Once work has been completed, all tools shall be removed from the area and all guards reinstalled, only then can the lockout/tagout devices be removed. All affected employees shall be notified that the equipment is safe for use.

- (11) Each site shall maintain a log containing all Lockout/Tagout operations performed on the site.

4.3.2 Lockout/Tagout Device Requirements. Lockout locks and tagout tags shall be recommended by the NWSH Safety Office as to the manufacturer and model number of locks and the type of tag and the wording used for lockout/tagout purposes. This is to ensure standardization of locks and tags as required by code.

- a. Lockout locks shall be individually identified by a number or similar marking to identify the individual that installed the lock. Lockout locks shall be used **only** for lockout purposes and shall be standardized at each facility.
- b. Tags shall be affixed to the lockout or isolation device by a means of a fastening device (e.g., wire or nylon cable ties) that exhibits a minimum breaking strength of 50 pounds and shall include a legend such as the following: **DANGER: DO NOT OPERATE, DO NOT START, DO NOT OPEN, DO NOT CLOSE, DO NOT ENERGIZE.**
- c. Lockout/Tagout devices shall only be removed by the individual who applied the device or his/her designated representative.
 - (1) When the authorized employee who applied the lockout lock and/or tagout tag is not available to remove it, other authorized employees may remove it provided that they:
 - (a) Understand the hazards created by removal of the lockout lock or tagout tag, and follow the requirements in this procedure for removal of lockout locks and/or tagout tags.
 - (b) Accept responsibility for and perform the following:
 - i Verify that the authorized employee who applied the lockout lock or tagout tag is not at the facility.
 - ii Make good faith effort to contact the authorized employee who applied the lockout lock or tagout tag to tell him that their lockout lock and/or tagout tag has been removed.
 - iii Ensure that the authorized employee who applied the lockout lock or tagout tag is told that their lockout lock

or tagout tag has been removed before that employee resumes work at the facility.

- iv Return the lock and tag to the authorized employee.
- v The appropriate supervisor is notified prior to or immediately after removal of the lock.

d. When jobs are worked by successive shifts, either:

- (1) The succeeding shift shall apply their lockout/tagout devices prior to the removal of the lockout/tagout devices already in place.
- (2) The on-coming shift is given the keys to locks and replaces the tags from the shift going off with their own.

4.3.3 Equipment Procedures. Equipment/systems that require lockout/tagout shall be identified and equipment-specific procedure shall be developed using the template in Attachment A. All lockout/tagout procedures shall be maintained and updated as necessary.

a. Equipment and systems may be exempted from this requirement provided all of the following elements exist and the exemption is approved by the Station Manger or his/her designee:

- (1) The machine or equipment has no potential for stored or residual energy or re-accumulation of stored energy after shut down.
- (2) The machine or equipment has a single energy source which can be readily identified and isolated.
- (3) The isolation and locking out of that energy source will completely de-energize and deactivate the machine or equipment.
- (4) The machine or equipment is isolated from that energy source and locked out during servicing or maintenance.
- (5) A single lockout device will achieve a locked-out condition.
- (6) The lockout device is under the exclusive control of the authorized employee performing the work.

- (7) The servicing or maintenance does not create hazards for other employees.
 - (8) There have been no accidents involving the unexpected activation or re-energizing of the machine or equipment during servicing or maintenance while using this exemption.
 - b. If the equipment does not meet the above guidelines, a procedure shall be developed that includes the following items:
 - (1) A detailed process to notify all affected employees.
 - (2) Specific steps for shutting down, isolating, blocking and securing equipment or systems to control hazardous energy.
 - (3) Specific steps for the placement, removal and transfer of lockout and or tagout devices and identification of the person who is responsible for them.
 - (4) Requirements for testing of equipment or systems to determine and verify the effectiveness of the lockout/tagout devices and any other energy control measures.
 - (5) Requirements for testing to ensure that there is no stored energy in the equipment that, if unexpectedly released (or released in an uncontrolled manner), poses risk of injury to the employee(s) working on or around the system/equipment. And, if there is stored energy, requirements for containing it or releasing it in a safe and controlled manner.
- 4.3.4 Training. Training shall be provided to ensure that the purpose of this procedure is understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy control devices are acquired by employees. The training shall include the following:
- a. Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.
 - b. Each affected employee shall be instructed in the purpose and use of the Energy Control Procedure.

- c. All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about this procedure, and about the prohibition relating to attempts to restart or re-energize machines or equipment which are locked out or tagged out.
- d. When tagout systems are used, employees shall also be trained in the following limitations of tags:
 - (1) Tags are essentially warning devices affixed to energy-isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.
 - (2) When a tag is attached to an energy-isolating means, it is not to be removed without the authorization of the person responsible for it, and it shall never be bypassed, ignored, or otherwise defeated.
 - (3) Tags shall be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area.
 - (4) Tags and their means of attachment shall be made of materials which will withstand the environmental conditions encountered in the workplace.
 - (5) Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall Energy Control Procedure.
 - (6) Tags shall be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.
- e. Affected employees shall be trained/retrained when there is a change in equipment, job assignment, or change in energy control procedures.
- f. Re-training shall also be performed when there are indications of inadequacies in the employee's knowledge or deviations from this procedure are observed or believed to be occurring.
- g. All training shall establish employee proficiency with the material and processes presented during the training.
- h. A certificate shall be issued containing the employee's name and date of training, indicating the employee has accomplished the required training. The

certification shall be kept up to date. A sample certificate has been included in Attachment C.

- i. Safety observer training shall be to the level required to sensitize the observer to unsafe work practices and to have the observer notify, warn, or otherwise advise the primary worker of any situation posing risk to personnel.

4.4 Quality Control

4.4.1 Regional or Operating Unit Environmental/Safety Coordinators

- a. Shall perform an annual assessment of the regional headquarters facilities or operating unit to monitor and promote compliance with the requirements of this procedure.
- b. Shall perform assessments or designate personnel to perform assessments of all field offices to monitor and promote compliance with the requirements of this procedure every two years.

4.4.2 Station Manager

- a. Shall review or delegate review, of this procedure on an annual basis to ensure that the facility is complying with its requirements. Confirmation of this review shall be forwarded to the Regional or Operating Unit Environmental/Safety Coordinator.
- b. Shall ensure that initial and periodic inventory of lockout/tagout devices, PPE and other safety equipment is accomplished and adequate stock is maintained.

4.4.3 NWS Headquarters (NWSH)

- a. The NWS Safety Office shall perform an annual assessment of the NWSH facilities to ensure that the facilities are in compliance with this procedure.
- b. The NWSH Safety Office shall periodically perform an assessment of the regional headquarters and field offices to ensure compliance with this procedure. The frequency of these regional and field office assessments shall be determined by the NWSH Safety Office.
- c. Requests for clarification concerning this procedure shall be directed to the NWSH Safety Office.

4.5 Responsibilities

4.5.1 Regional or Operating Unit Environmental/Safety Coordinators*

- a. Shall monitor and coordinate to promote compliance with the requirements of this procedure for the regional headquarters, and field offices or operating units.
- b. Shall ensure that procedures are developed at regional headquarters or operating unit facilities for equipment that require lockout/tagout.

4.5.2 Station Manager*

- a. Shall have oversight over the implementation of this procedure, and ensure that the requirements of this procedure are followed by individuals at the NWS facility.
- b. Shall ensure that procedures are developed at NWS field offices for equipment that require lockout/tagout.
- c. Shall ensure NWS employees follow the requirements of this procedure when performing lockout/tagout procedures.

4.5.3 Safety or Environmental/Safety Focal Point*

Shall ensure that any responsibilities delegated to them by the Station Manager are implemented in accordance with the requirements of this procedure.

4.5.4 Employees

- a. Individual employees affected by this procedure are required to read, understand and comply with the requirements of this procedure.
- b. Report unsafe or unhealthful conditions and practices to their supervisor or safety focal point.

4.6 References

- 4.6.1 American National Standards Institute Z 244.1-1982, 'Lockout/Tagout of Energy Sources - Minimum Safety Requirements.'
- 4.6.2 U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910.147, 'The Control Of Hazardous Energy (Lockout/Tagout).'
- 4.6.3 National Fire Protection Association, NFPA 70, NEC.
- 4.6.4 NWS Occupational Safety and Health Procedure 3, "Safe Electrical Work Practices."

4.7 Attachments

Attachment A. Equipment Lockout/Tagout Procedure Template

Attachment B. Sample List of NWS Equipment Requiring Lockout/Tagout Procedure

Attachment C. Sample Training Certificate

Attachment D. Lockout/Tagout Procedures (WFO Springfield, MO)

ATTACHMENT A

Equipment Lockout/Tagout Procedure Template

Lockout/Tagout Procedure

Equipment_____Location_____

1. Make Notifications

Notify affected employees that a lockout is required, the reason for the lockout, and the expected duration. List the Name(s) of affected employees and how to notify them.

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2. Machine or Equipment Isolation

Determine all sources of energy feeding into the machine or equipment and the location of the isolation device needed to isolate the machine or equipment from the energy source. List the location of all energy sources and the sequence in which they need to be isolated. **Note:** The Equipment Manuals and Operations and Maintenance Manuals for the specific piece of equipment should provide the location and type of energy sources feeding into the equipment.

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3. Shutdown Equipment

Provide the appropriate procedure to shut down the equipment.

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4. Lockout or Tagout Device Application

List the location of all lockout devices. If a lockout device cannot be applied list the location of the tagout device and any additional precautions taken to ensure the level of safety is equal to that of a lockout device.

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5. Release Stored Energy

List any devices that may contain stored energy and the process to safely release or contain this energy. Examples include, but are not limited to, capacitors, springs, hydraulic cylinders, and pressurized piping.

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6. Verification of Isolation

To ensure that all energy sources have been isolated, ensure that no personnel can be exposed to operating machinery or equipment, operate all controls to ensure that the equipment will not operate. List all controls that need to be tested and all indicators that should be observed to ensure the equipment has been isolated from all energy sources. **CAUTION** ensure all controls have been returned to the off or neutral position upon completion of the test.

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7. Jogging or Cycling

If, during repair or maintenance activities, the machine or equipment is required to be jogged or cycled list the location of lockout/tagout device(s) is removed to accomplish this. Only the lockout/tagout devices absolutely necessary to allow the equipment or machine to be jogged or cycled should be removed. After the equipment or machine has been cycled or jogged the lockout/tagout devices shall be reapplied and steps two through six shall be repeated prior to commencing work.

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8. Release from Lockout/Tagout and Restoring to Service

Before lockout/tagout devices are removed and energy is restored to the machine or equipment, inspect the area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

- C Check the work area to ensure that all employees are clear of the equipment or machine.
- C Verify that all controls are in their neutral or off position.
- C Each lockout/tagout device shall be removed from each energy isolation device by the employee who applied the device.
- C Notify all affected employees that the lockout/tagout devices have been removed and the machine or equipment is safe for use.

ATTACHMENT B

Sample List of NWS Equipment Requiring Lockout/Tagout Procedure

NOTE: *This list is representative, not all inclusive*

1. Radar WSR-88D including all of the major groups of equipment:

- a. Radar Data Acquisition (RDA) Group
- b. Wide-Band Communication (WBC) Group,
- c. Radar Product Generator (RPG) Group,
- d. Principal User Processor (PUP) Group, and
- e. Real Property Installed Equipment (RPIE) Group.
- f. Rotary UPS. (RUPS)
- g. Diesel Driven Generator (DDG).

Consult operations and maintenance instructions for the WSR-88D system found in Radar Systems EHB-6-510, and EHB-6-511 for the location of the power feeds and safety precautions for this system.

2. NOAA Weather Radio and the following components:

- a. Exciters
- b. Power Amplifiers
- c. Power Supply Units
- d. Cabinet Components

Consult the Operator Maintenance Instruction Manuals for SR-416D Dual VHF FM and WRT-1000 Dual 1 KW Transmitter Systems for the location of the power feeds and safety precautions for these units.

3. Upper Air Systems and the following components:

- a. Antenna and Pedestal assembly (Unit 1)
- b. Signal/Power Distribution (Unit 2)
- c. Data Control Assembly (Unit 3)

- d. ART Printer (Unit 4)
- e. Remote Control Unit (Unit 5)
- f. Range Antenna Assembly (ART-1R)
- g. Phase Comparator Assembly (ART-1R)
- h. 403 MHz Transmitter (ART-1R)

Consult the Operator Maintenance Instruction Manuals for the location of the power feeds and safety precautions for these components.

- 4. Any portion of the electrical wiring system of the forecasting offices and surrounding structures to include but not limited to:
 - a. Electrical outlets
 - b. Lighting systems
 - c. Main distribution unit for the facility
 - d. Auxiliary circuit panels
 - e. Emergency Generator (*This unit shall be isolated to ensure this unit does not accidentally start-up while being serviced*)
 - f. Security and Fire Alarm Systems

<p>NOTE: The low voltage side of these systems (<50 volts) are exempted from the requirements of this procedure)</p>
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- g. Uninterruptable Power System (P). *Note: See Attachment 4L for UPS energy isolation and Attachments 4M and 5 for UPS battery replacement.*
 - h. House Air Handling Units and Air Condensing Units.
 - i. Future TMPS Systems.
 - j. ASOS Systems.
- 5. Cranes used at the NDBC shall be locked and tagged out when servicing activities could expose an individual to injury by an inadvertent start-up of the unit. Examples of service to the cranes that would require lockout/tagout include but are not limited to;
- 6. Maintenance of the hoisting unit of the bridge crane in the high-bay.
- 7. Maintenance of the hydraulic system on the portable crane used to move the buoys.

NOTE: It was indicated that these cranes are not serviced by NWS personnel or their contractors. However, NWS personnel shall ensure that the servicing personnel lock or tagout this equipment to prevent an accidental start-up of these units by NWS personnel.

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Sample Training Certificate

**CERTIFICATE
OF
COMPLETION**

Let it be known that

has satisfactorily completed the requirements for employee training in

Lockout/Tagout Procedures

Instructor

Date

NWSM 50-1115 SEPTEMBER 4, 2002

ATTACHMENT D

**Lockout/Tagout Procedures
WFO Springfield, MO**

NWSM 50-1115 SEPTEMBER 4, 2002

ATTACHMENT D-1

Lockout/Tagout Procedure

NEXRAD Overview

Equipment: NEXRAD RDA*, RPG, PUP and AWIPS

Location: RDA Shelter WFO Springfield, MO

The electrical service is delivered to these systems components through power cords that can be unplugged. The components are then removed from their cabinets and taken to a centralized service area for repair. The procedures provided in the respective maintenance manuals satisfy the exception for Lockout/Tagout Standard.

Examples of these components include:

1. SOPS/Micro5
2. VME
3. SCSI
4. Modem Rack
5. RAMTEK
6. PUP/RPG Workstations

For the RPG, PUP, and AWIPS: this procedure is all encompassing since all AC sources are unpluggable AC.

* RDA components transmitter, receiver, signal processor, pedestal electronics, waveguide pressurization unit, and main PDP circuits have Lockout/Tagout Procedures because they do not have unpluggable AC sources.

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ATTACHMENT D-2
Lockout/Tagout Procedure

Equipment: NEXRAD Pedestal Electronics

Location: RDA Shelter WSO Springfield, MO

1. Make Notifications

Notify affected employees that a lockout is required, the reason for the lockout, and the expected duration. List the Name(s) of affected employees and how to notify them.

1. Electronics Systems Analysts
2. Meteorologist in Charge
3. Lead Forecaster

2. Machine or Equipment Isolation

Determine all sources of energy feeding into the machine or equipment and the location of the isolation device needed to isolate the machine or equipment from the energy source. List the location of all energy sources and the sequence in which they need to be isolated. **Note:** The Equipment Manuals and Operations and Maintenance Manuals for the specific piece of equipment should provide the location and type of energy sources feeding into the equipment.

1. Secondary Power Distribution Panel, CB2, CB4, and CB6 (ganged)
2. UD5A2S3 Pedestal Electronics Power Switch

3. Shutdown Equipment

Provide the appropriate procedure to shut down the equipment.

Under ordinary corrective and preventive maintenance, existing procedures in the EHB 6-510 Table 6-5.2, steps 1 through 5g and 13 through 15, provides sufficient energy isolation that additional lockout/tagout are not required. However, if the circuit is left unattended for any reason, provide full Lockout/Tagout Device Application .

4. Lockout or Tagout Device Application

List the location of all lockout devices. If a lockout device cannot be applied list the location of the tagout device and any additional precautions taken to ensure the level of safety is equal to that of a lockout device.

1. Secondary Power Distribution Panel, CB2, CB4, and CB6 (ganged)

5. Release Stored Energy

List any devices that may contain stored energy and the process to safely release or contain this energy. Examples include, but are not limited to, capacitors, springs, hydraulic cylinders, and pressurized piping.

N/A

6. Verification of Isolation

To ensure that all energy sources have been isolated, ensure that no personnel can be exposed to operating machinery or equipment, operate all controls to ensure that the equipment will not operate. List all controls that need to be tested and all indicators that should be observed to ensure the equipment has been isolated from all energy sources. “**CAUTION**” ensure all controls have been returned to the off or neutral position upon completion of the test.

Use Multi-meter to verify that no voltage is present.

7. Jogging or Cycling

If, during repair or maintenance activities, the machine or equipment is required to be jogged or cycled list the location of lockout/tagout device(s) is removed to accomplish this. Only the lockout/tagout devices absolutely necessary to allow the equipment or machine to be jogged or cycled should be removed. After the equipment or machine has been cycled or jogged the lockout/tagout devices shall be reapplied and steps two through six shall be repeated prior to commencing work.

N/A

8. Release from Lockout/Tagout and Restoring to Service

Before lockout/tagout devices are removed and energy is restored to the machine or equipment, inspect the area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

- Check the work area to ensure that all employees are clear of the equipment or machine.
- Verify that all controls are in their neutral or off position.
- Each lockout/tagout device shall be removed from each energy isolation device by the employee who applied the device.
- Notify all affected employees that the lockout/tagout devices have been removed and the machine or equipment is safe for use.

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ATTACHMENT D-3

Lockout/Tagout Procedure

Equipment: NEXRAD Receiver

Location: RDA Shelter WSO Springfield, MO

1. Make Notifications

Notify affected employees that a lockout is required, the reason for the lockout, and the expected duration. List the Name(s) of affected employees and how to notify them.

1. Electronics Systems Analysts
2. Meteorologist in Charge
3. Lead Forecaster

2. Machine or Equipment Isolation

Determine all sources of energy feeding into the machine or equipment and the location of the isolation device needed to isolate the machine or equipment from the energy source. List the location of all energy sources and the sequence in which they need to be isolated. **Note:** The Equipment Manuals and Operations and Maintenance Manuals for the specific piece of equipment should provide the location and type of energy sources feeding into the equipment.

Secondary Power Distribution Panel, CB22

3. Shutdown Equipment

Provide the appropriate procedure to shut down the equipment.

Under ordinary corrective and preventive maintenance, existing procedures in the EHB 6-510 Table 6-5.2, steps 1 through 6, provides sufficient energy isolation that additional lockout/tagout are not required. However, if the circuit is left unattended for any reason, provide full Lockout/Tagout Device Application .

4. Lockout or Tagout Device Application

List the location of all lockout devices. If a lockout device cannot be applied list the location of the tagout device and any additional precautions taken to ensure the level of safety is equal to that of a lockout device.

1. Secondary Power Distribution Panel, CB22

5. Release Stored Energy

List any devices that may contain stored energy and the process to safely release or contain this energy. Examples include, but are not limited to, capacitors, springs, hydraulic cylinders, and pressurized piping.

N/A

6. Verification of Isolation

To ensure that all energy sources have been isolated, ensure that no personnel can be exposed to operating machinery or equipment, operate all controls to ensure that the equipment will not operate. List all controls that need to be tested and all indicators that should be observed to ensure the equipment has been isolated from all energy sources. “**CAUTION**” ensure all controls have been returned to the off or neutral position upon completion of the test.

Use Multi-meter to verify that no voltage is present.

7. Jogging or Cycling

If, during repair or maintenance activities, the machine or equipment is required to be jogged or cycled list the location of lockout/tagout device(s) is removed to accomplish this. Only the lockout/tagout devices absolutely necessary to allow the equipment or machine to be jogged or cycled should be removed. After the equipment or machine has been cycled or jogged the lockout/tagout devices shall be reapplied and steps two through six shall be repeated prior to commencing work.

N/A

8. Release from Lockout/Tagout and Restoring to Service

Before lockout/tagout devices are removed and energy is restored to the machine or equipment, inspect the area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

- Check the work area to ensure that all employees are clear of the equipment or machine.
- Verify that all controls are in their neutral or off position.
- Each lockout/tagout device shall be removed from each energy isolation device by the employee who applied the device.
- Notify all affected employees that the lockout/tagout devices have been removed and the machine or equipment is safe for use.

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ATTACHMENT D-4

Lockout/Tagout Procedure

Equipment: RDA Generator

Location: RDA Generator Shed WFO Springfield, MO

1. Make Notifications

Notify affected employees that a lockout is required, the reason for the lockout, and the expected duration. List the Name(s) of affected employees and how to notify them.

1. Electronics Systems Analysts
2. Meteorologist in Charge
3. Lead Forecaster

2. Machine or Equipment Isolation

Determine all sources of energy feeding into the machine or equipment and the location of the isolation device needed to isolate the machine or equipment from the energy source. List the location of all energy sources and the sequence in which they need to be isolated. **Note:** The Equipment Manuals and Operations and Maintenance Manuals for the specific piece of equipment should provide the location and type of energy sources feeding into the equipment.

1. Control Switch on the RDA Generator in the RDA Generator Building.

3. Shutdown Equipment

Provide the appropriate procedure to shut down the equipment.

1. Turn the Control Switch on the RDA Generator in the RDA Generator Building to the OFF position.

4. Lockout or Tagout Device Application

List the location of all lockout devices. If a lockout device cannot be applied list the location of the tagout device and any additional precautions taken to ensure the level of safety is equal to that of a lockout device.

1. Turn the Control Switch on the RDA Generator in the RDA Generator Building to the OFF position and lockout/tagout.

5. Release Stored Energy

List any devices that may contain stored energy and the process to safely release or contain this energy. Examples include, but are not limited to, capacitors, springs, hydraulic cylinders, and pressurized piping.

N/A

6. Verification of Isolation

To ensure that all energy sources have been isolated, ensure that no personnel can be exposed to operating machinery or equipment, operate all controls to ensure that the equipment will not operate. List all controls that need to be tested and all indicators that should be observed to ensure the equipment has been isolated from all energy sources. **CAUTION** ensure all controls have been returned to the off or neutral position upon completion of the test.

Use Multi-meter to verify that no voltage is present.

7. Jogging or Cycling

If, during repair or maintenance activities, the machine or equipment is required to be jogged or cycled list the location of lockout/tagout device(s) is removed to accomplish this. Only the lockout/tagout devices absolutely necessary to allow the equipment or machine to be jogged or cycled should be removed. After the equipment or machine has been cycled or jogged the

lockout/tagout devices shall be reapplied and steps two through six shall be repeated prior to commencing work.

N/A

8. Release from Lockout/Tagout and Restoring to Service

Before lockout/tagout devices are removed and energy is restored to the machine or equipment, inspect the area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

- Check the work area to ensure that all employees are clear of the equipment or machine.
- Verify that all controls are in their neutral or off position.
- Each lockout/tagout device shall be removed from each energy isolation device by the employee who applied the device.
- Notify all affected employees that the lockout/tagout devices have been removed and the machine or equipment is safe for use.

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ATTACHMENT D-5

Lockout/Tagout Procedure

Equipment: NEXRAD Signal Processor

Location: RDA Shelter WSO Springfield, MO

1. Make Notifications

Notify affected employees that a lockout is required, the reason for the lockout, and the expected duration. List the Name(s) of affected employees and how to notify them.

1. Electronics Systems Analysts
2. Meteorologist in Charge
3. Lead Forecaster

2. Machine or Equipment Isolation

Determine all sources of energy feeding into the machine or equipment and the location of the isolation device needed to isolate the machine or equipment from the energy source. List the location of all energy sources and the sequence in which they need to be isolated. **Note:** The Equipment Manuals and Operations and Maintenance Manuals for the specific piece of equipment should provide the location and type of energy sources feeding into the equipment.

1. Secondary Power Distribution Panel, CB16 and CB18 (ganged)
2. UD5A2S4 DAU Power Switch

3. Shutdown Equipment

Provide the appropriate procedure to shut down the equipment.

Under ordinary corrective and preventive maintenance, existing procedures in the EHB 6-510 Table 6-5.2, steps 1 through 5g, 21, and 22, provides sufficient energy isolation that additional lockout/tagout are not required. However, if the circuit is left unattended for any reason, provide full Lockout/Tagout Device Application .

4. Lockout or Tagout Device Application

List the location of all lockout devices. If a lockout device cannot be applied list the location of the tagout device and any additional precautions taken to ensure the level of safety is equal to that of a lockout device.

1. Secondary Power Distribution Panel, CB16 and CB18 (ganged)

5. Release Stored Energy

List any devices that may contain stored energy and the process to safely release or contain this energy. Examples include, but are not limited to, capacitors, springs, hydraulic cylinders, and pressurized piping.

N/A

6. Verification of Isolation

To ensure that all energy sources have been isolated, ensure that no personnel can be exposed to operating machinery or equipment, operate all controls to ensure that the equipment will not operate. List all controls that need to be tested and all indicators that should be observed to ensure the equipment has been isolated from all energy sources. **CAUTION** ensure all controls have been returned to the off or neutral position upon completion of the test.

Use Multi-meter to verify that no voltage is present.

7. Jogging or Cycling

If, during repair or maintenance activities, the machine or equipment is required to be jogged or cycled list the location of lockout/tagout device(s) is removed to accomplish this. Only the

lockout/tagout devices absolutely necessary to allow the equipment or machine to be jogged or cycled should be removed. After the equipment or machine has been cycled or jogged the lockout/tagout devices shall be reapplied and steps two through six shall be repeated prior to commencing work.

N/A

8. Release from Lockout/Tagout and Restoring to Service

Before lockout/tagout devices are removed and energy is restored to the machine or equipment, inspect the area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

- Check the work area to ensure that all employees are clear of the equipment or machine.
- Verify that all controls are in their neutral or off position.
- Each lockout/tagout device shall be removed from each energy isolation device by the employee who applied the device.
- Notify all affected employees that the lockout/tagout devices have been removed and the machine or equipment is safe for use.

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ATTACHMENT D-6

Lockout/Tagout Procedure

Equipment: NEXRAD Waveguide Pressurization Unit

Location: RDA Shelter WSO Springfield, MO

1. Make Notifications

Notify affected employees that a lockout is required, the reason for the lockout, and the expected duration. List the Name(s) of affected employees and how to notify them.

- | |
|---|
| <ol style="list-style-type: none">1. Electronics Systems Analysts2. Meteorologist in Charge3. Lead Forecaster |
|---|

2. Machine or Equipment Isolation

Determine all sources of energy feeding into the machine or equipment and the location of the isolation device needed to isolate the machine or equipment from the energy source. List the location of all energy sources and the sequence in which they need to be isolated. **Note:** The Equipment Manuals and Operations and Maintenance Manuals for the specific piece of equipment should provide the location and type of energy sources feeding into the equipment.

- | |
|---|
| <ol style="list-style-type: none">1. Secondary Power Distribution Panel, CB82. UD6CB1Power On/Off switch |
|---|

3. Shutdown Equipment

Provide the appropriate procedure to shut down the equipment.

Under ordinary corrective and preventive maintenance, existing procedures in the EHB 6-510 Table 6-5.2, steps 1 through 5g, 11 and 12, provides sufficient energy isolation that additional lockout/tagout are not required. However, if the circuit is left unattended for any reason, provide full Lockout/Tagout Device Application .

4. Lockout or Tagout Device Application

List the location of all lockout devices. If a lockout device cannot be applied list the location of the tagout device and any additional precautions taken to ensure the level of safety is equal to that of a lockout device.

1. Secondary Power Distribution Panel, CB8

5. Release Stored Energy

List any devices that may contain stored energy and the process to safely release or contain this energy. Examples include, but are not limited to, capacitors, springs, hydraulic cylinders, and pressurized piping.

N/A

6. Verification of Isolation

To ensure that all energy sources have been isolated, ensure that no personnel can be exposed to operating machinery or equipment, operate all controls to ensure that the equipment will not operate. List all controls that need to be tested and all indicators that should be observed to ensure the equipment has been isolated from all energy sources. “**CAUTION**” ensure all controls have been returned to the off or neutral position upon completion of the test.

Use Multi-meter to verify that no voltage is present.

7. Jogging or Cycling

If, during repair or maintenance activities, the machine or equipment is required to be jogged or cycled list the location of lockout/tagout device(s) is removed to accomplish this. Only the lockout/tagout devices absolutely necessary to allow the equipment or machine to be jogged or cycled should be removed. After the equipment or machine has been cycled or jogged the lockout/tagout devices shall be reapplied and steps two through six shall be repeated prior to commencing work.

N/A

8. Release from Lockout/Tagout and Restoring to Service

Before lockout/tagout devices are removed and energy is restored to the machine or equipment, inspect the area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

- Check the work area to ensure that all employees are clear of the equipment or machine.
- Verify that all controls are in their neutral or off position.
- Each lockout/tagout device shall be removed from each energy isolation device by the employee who applied the device.
- Notify all affected employees that the lockout/tagout devices have been removed and the machine or equipment is safe for use.

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ATTACHMENT D-7

Lockout/Tagout Procedure

Equipment NEXRAD RDASC

Location RDA Shelter WSO Springfield, MO

1. Make Notifications

Notify affected employees that a lockout is required, the reason for the lockout, and the expected duration. List the Name(s) of affected employees and how to notify them.

- | |
|---|
| <ol style="list-style-type: none">1. Electronics Systems Analysts2. Meteorologist in Charge3. Lead Forecaster |
|---|

2. Machine or Equipment Isolation

Determine all sources of energy feeding into the machine or equipment and the location of the isolation device needed to isolate the machine or equipment from the energy source. List the location of all energy sources and the sequence in which they need to be isolated. **Note:** The Equipment Manuals and Operations and Maintenance Manuals for the specific piece of equipment should provide the location and type of energy sources feeding into the equipment.

Secondary Power Distribution Panel, CB15.CB17, and CB19 (ganged)
--

3. Shutdown Equipment

Provide the appropriate procedure to shut down the equipment.

Under ordinary corrective and preventive maintenance, existing procedures in the EHB 6-510 Table 6-5.2, steps 1 through 5g and 17 through 20, provides sufficient energy isolation that additional lockout/tagout are not required. However, if the circuit is left unattended for any reason, provide full Lockout/Tagout Device Application .

4. Lockout or Tagout Device Application

List the location of all lockout devices. If a lockout device cannot be applied list the location of the tagout device and any additional precautions taken to ensure the level of safety is equal to that of a lockout device..

1. Secondary Power Distribution Panel, CB16 and CB18 (ganged)

5. Release Stored Energy

List any devices that may contain stored energy and the process to safely release or contain this energy. Examples include, but are not limited to, capacitors, springs, hydraulic cylinders, and pressurized piping.

N/A

6. Verification of Isolation

To ensure that all energy sources have been isolated, ensure that no personnel can be exposed to operating machinery or equipment, operate all controls to ensure that the equipment will not operate. List all controls that need to be tested and all indicators that should be observed to ensure the equipment has been isolated from all energy sources. "**CAUTION**" ensure all controls have been returned to the off or neutral position upon completion of the test.

Use Multi-meter to verify that no voltage is present.

7. Jogging or Cycling

If, during repair or maintenance activities, the machine or equipment is required to be jogged or cycled list the location of lockout/tagout device(s) is removed to accomplish this. Only the lockout/tagout devices absolutely necessary to allow the equipment or machine to be jogged or cycled should be removed. After the equipment or machine has been cycled or jogged the lockout/tagout devices shall be reapplied and steps two through six shall be repeated prior to commencing work.

N/A

8. Release from Lockout/Tagout and Restoring to Service

Before lockout/tagout devices are removed and energy is restored to the machine or equipment, inspect the area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

- Check the work area to ensure that all employees are clear of the equipment or machine.
- Verify that all controls are in their neutral or off position.
- Each lockout/tagout device shall be removed from each energy isolation device by the employee who applied the device.
- Notify all affected employees that the lockout/tagout devices have been removed and the machine or equipment is safe for use.

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ATTACHMENT D-8

Lockout/Tagout Procedure

Equipment: NEXRAD Transmitter

Location: RDA Shelter WSO Springfield, MO

1. Make Notifications

Notify affected employees that a lockout is required, the reason for the lockout, and the expected duration. List the Name(s) of affected employees and how to notify them.

- | |
|---|
| <ol style="list-style-type: none">1. Electronics Systems Analysts2. Meteorologist in Charge3. Lead Forecaster |
|---|

2. Machine or Equipment Isolation

Determine all sources of energy feeding into the machine or equipment and the location of the isolation device needed to isolate the machine or equipment from the energy source. List the location of all energy sources and the sequence in which they need to be isolated. **Note:** The Equipment Manuals and Operations and Maintenance Manuals for the specific piece of equipment should provide the location and type of energy sources feeding into the equipment.

See EHB 6-511 para. 3.4.1.2 step5a thru step 5c

3. Shutdown Equipment

Provide the appropriate procedure to shut down the equipment.

Under ordinary corrective and preventive maintenance, existing procedures in the EHB 6-511 para. 3.4.1.2 step 1 thru 3.4.1.2 step 5c provide sufficient energy isolation that additional lockout/tagout are not required. However, if the circuit is left unattended for any reason, provide full Lockout/Tagout Device Application .

4. Lockout or Tagout Device Application

List the location of all lockout devices. If a lockout device cannot be applied list the location of the tagout device and any additional precautions taken to ensure the level of safety is equal to that of a lockout device.

1. UD3 CB1 High voltage circuit breaker interlock key
2. Secondary Power Distribution Panel, CB1,3,5 (ganged) and CB7

5. Release Stored Energy

List any devices that may contain stored energy and the process to safely release or contain this energy. Examples include, but are not limited to, capacitors, springs, hydraulic cylinders, and pressurized piping.

1. Filter Capacitor Bank 3A9: Opening the right bay inner door releases the discharge plunger.
2. Modulator Pulse Assembly UD3A12: Use the grounding stick per EHB 6-511 Repair Procedures.
3. Oil Tank Assembly UD3A7: Use the grounding stick per EHB 6-511 Repair Procedures.

6. Verification of Isolation

To ensure that all energy sources have been isolated, ensure that no personnel can be exposed to operating machinery or equipment, operate all controls to ensure that the equipment will not operate. List all controls that need to be tested and all indicators that should be observed to ensure the equipment has been isolated from all energy sources. “**CAUTION**” ensure all controls have been returned to the off or neutral position upon completion of the test.

Use Multi-meter to verify that no voltage is present.

7. Jogging or Cycling

If, during repair or maintenance activities, the machine or equipment is required to be jogged or cycled list the location of lockout/tagout device(s) is removed to accomplish this. Only the lockout/tagout devices absolutely necessary to allow the equipment or machine to be jogged or cycled should be removed. After the equipment or machine has been cycled or jogged the lockout/tagout devices shall be reapplied and steps two through six shall be repeated prior to commencing work.

N/A

8. Release from Lockout/Tagout and Restoring to Service

Before lockout/tagout devices are removed and energy is restored to the machine or equipment, inspect the area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

- Check the work area to ensure that all employees are clear of the equipment or machine.
- Verify that all controls are in their neutral or off position.
- Each lockout/tagout device shall be removed from each energy isolation device by the employee who applied the device.
- Notify all affected employees that the lockout/tagout devices have been removed and the machine or equipment is safe for use.

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ATTACHMENT D-9

Lockout/Tagout Procedure

Equipment: RDA Generator and Transfer Switch

Location: RDA Generator Shelter WFO Springfield, MO

1. Make Notifications

Notify affected employees that a lockout is required, the reason for the lockout, and the expected duration. List the Name(s) of affected employees and how to notify them.

1. Electronics Systems Analysts
2. Meteorologist in Charge
3. Lead Forecaster

2. Machine or Equipment Isolation

Determine all sources of energy feeding into the machine or equipment and the location of the isolation device needed to isolate the machine or equipment from the energy source. List the location of all energy sources and the sequence in which they need to be isolated. **Note:** The Equipment Manuals and Operations and Maintenance Manuals for the specific piece of equipment should provide the location and type of energy sources feeding into the equipment.

1. Master generator switch on the Generator Control Panel in the RDA Generator Shelter.
2. Utility Main Power Disconnect Switch in the RDA Generator Shelter or Main Site Disconnect Switch located outside the RDA Generator Shelter.

3. Shutdown Equipment

Provide the appropriate procedure to shut down the equipment.

1. Turn the Transfer switch Control Key on the Transfer Switch Cabinet in the RDA Generator Shelter to the OFF position and remove the key.
2. Turn the Control Switch on the Generator in the RDA Generator Shelter to the OFF position.

4. Lockout or Tagout Device Application

List the location of all lockout devices. If a lockout device cannot be applied list the location of the tagout device and any additional precautions taken to ensure the level of safety is equal to that of a lockout device.

1. Disable the engine generator (Onan or Kohler) in the RDA Generator Shelter as follows:
 - a. On the Onan Generator Control Panel, push the EMERGENCY STOP button in and set the RUN-STOP(RESET)-REMOTE switch to STOP(RESET), or
 - b. On the Kohler Generator Control Panel, push the EMERGENCY STOP button in and set the RUN-OFF/RESET-AUTO switch to OFF/RESET.
2. Sites with a Transition Power Source (TPS), perform TPS shutdown procedure.
3. In the RDA Generator Shelter, set the Utility Main Power Disconnect Switch to OFF.
Sites without a disconnect switch in the generator shelter, set the Main Site Disconnect Switch to OFF.

5. Release Stored Energy

List any devices that may contain stored energy and the process to safely release or contain this energy. Examples include, but are not limited to, capacitors, springs, hydraulic cylinders, and pressurized piping.

N/A

6. Verification of Isolation

To ensure that all energy sources have been isolated, ensure that no personnel can be exposed to operating machinery or equipment, operate all controls to ensure that the equipment will not operate. List all controls that need to be tested and all indicators that should be observed to ensure the equipment has been isolated from all energy sources. “**CAUTION**” ensure all controls have been returned to the off or neutral position upon completion of the test.

Use Multi-meter to verify that no voltage is present.

7. Jogging or Cycling

If, during repair or maintenance activities, the machine or equipment is required to be jogged or cycled list the location of lockout/tagout device(s) is removed to accomplish this. Only the lockout/tagout devices absolutely necessary to allow the equipment or machine to be jogged or cycled should be removed. After the equipment or machine has been cycled or jogged the lockout/tagout devices shall be reapplied and steps two through six shall be repeated prior to commencing work.

N/A

8. Release from Lockout/Tagout and Restoring to Service

Before lockout/tagout devices are removed and energy is restored to the machine or equipment, inspect the area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

- Check the work area to ensure that all employees are clear of the equipment or machine.
- Verify that all controls are in their neutral or off position.

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- Each lockout/tagout device shall be removed from each energy isolation device by the employee who applied the device.
- Notify all affected employees that the lockout/tagout devices have been removed and the machine or equipment is safe for use.

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ATTACHMENT D-10

Lockout/Tagout Procedure

Equipment: Upper Air Tracking Radar
Location: Upper Air Building Springfield, MO

1. Make Notifications

Notify affected employees that a lockout is required, the reason for the lockout, and the expected duration. List the Name(s) of affected employees and how to notify them.

- | |
|---|
| <ol style="list-style-type: none">1. Electronics Systems Analysts2. Meteorologist in Charge3. Lead Forecaster |
|---|

2. Machine or Equipment Isolation

Determine all sources of energy feeding into the machine or equipment and the location of the isolation device needed to isolate the machine or equipment from the energy source. List the location of all energy sources and the sequence in which they need to be isolated. **Note:** The Equipment Manuals and Operations and Maintenance Manuals for the specific piece of equipment should provide the location and type of energy sources feeding into the equipment.

- | |
|--|
| <ol style="list-style-type: none">1. The WBRT On/Off main power toggle switch, which is located on the control panel inside the Dome of the Upper Air Building:2. The WBRT Drive Motors are supplied by Circuit 7, which is located in the Electrical Branch Circuit Panel on the exterior of the Upper Air Building. |
|--|

3. Shutdown Equipment

Provide the appropriate procedure to shut down the equipment.

1. Flip the WBRT On/Off main power toggle switch at the control panel inside the Dome of the Upper Air Building to the OFF position.
2. Open Circuit 7 on the Branch Circuit panel located on the outside of the Upper Air Building

4. Lockout or Tagout Device Application

List the location of all lockout devices. If a lockout device cannot be applied list the location of the tagout device and any additional precautions taken to ensure the level of safety is equal to that of a lockout device.

1. Lockout/tagout Circuit 7, which is located in the Electrical Branch Circuit Panel on the exterior of the Upper Air Building.

5. Release Stored Energy

List any devices that may contain stored energy and the process to safely release or contain this energy. Examples include, but are not limited to, capacitors, springs, hydraulic cylinders, and pressurized piping.

N/A

6. Verification of Isolation

To ensure that all energy sources have been isolated, ensure that no personnel can be exposed to operating machinery or equipment, operate all controls to ensure that the equipment will not operate. List all controls that need to be tested and all indicators that should be observed to ensure the equipment has been isolated from all energy sources. “**CAUTION**” ensure all controls have been returned to the off or neutral position upon completion of the test.

Use Multi-meter to verify that no voltage is present.

7. Jogging or Cycling

If, during repair or maintenance activities, the machine or equipment is required to be jogged or cycled list the location of lockout/tagout device(s) is removed to accomplish this. Only the lockout/tagout devices absolutely necessary to allow the equipment or machine to be jogged or cycled should be removed. After the equipment or machine has been cycled or jogged the lockout/tagout devices shall be reapplied and steps two through six shall be repeated prior to commencing work.

N/A

8. Release from Lockout/Tagout and Restoring to Service

Before lockout/tagout devices are removed and energy is restored to the machine or equipment, inspect the area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

- Check the work area to ensure that all employees are clear of the equipment or machine.
- Verify that all controls are in their neutral or off position.
- Each lockout/tagout device shall be removed from each energy isolation device by the employee who applied the device.
- Notify all affected employees that the lockout/tagout devices have been removed and the machine or equipment is safe for use.

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ATTACHMENT D-11

Lockout/Tagout Procedure

Equipment: Generator and Transfer Switch
Location: Generator Building WFO Springfield, MO

1. Make Notifications

Notify affected employees that a lockout is required, the reason for the lockout, and the expected duration. List the Name(s) of affected employees and how to notify them.

1. Electronics Systems Analysts
2. Meteorologist in Charge
3. Lead Forecaster

2. Machine or Equipment Isolation

Determine all sources of energy feeding into the machine or equipment and the location of the isolation device needed to isolate the machine or equipment from the energy source. List the location of all energy sources and the sequence in which they need to be isolated. **Note:** The Equipment Manuals and Operations and Maintenance Manuals for the specific piece of equipment should provide the location and type of energy sources feeding into the equipment.

1. Master generator switch on the Generator Control Panel in the WFO Generator Shelter or Electrical Room.
2. Utility Main Power Disconnect Switch in the WFO Generator Shelter or Main Site Disconnect Switch located outside the WFO Generator Shelter.

3. Shutdown Equipment

Provide the appropriate procedure to shut down the equipment.

1. Turn the Transfer switch Control Key on the Transfer Switch Cabinet in the WFO Electrical Room to the OFF position and remove the key.
2. Turn the Control Switch on the Generator in the Generator Building to the OFF position.

4. Lockout or Tagout Device Application

List the location of all lockout devices. If a lockout device cannot be applied list the location of the tagout device and any additional precautions taken to ensure the level of safety is equal to that of a lockout device.

1. Disable the engine generator in the WFO Generator Shelter by pushing the EMERGENCY STOP button in and setting the master generator switch to the STOP of OFF position.
2. Sites with an Uninterruptible Power Source (UPS), perform UPS shutdown procedure.
3. In the RDA Generator Shelter, set the Utility Main Power Disconnect Switch to OFF.

Sites without a disconnect switch in the generator shelter, set the Main Site Disconnect Switch to OFF.

5. Release Stored Energy

List any devices that may contain stored energy and the process to safely release or contain this energy. Examples include, but are not limited to, capacitors, springs, hydraulic cylinders, and pressurized piping.

N/A

6. Verification of Isolation

To ensure that all energy sources have been isolated, ensure that no personnel can be exposed to operating machinery or equipment, operate all controls to ensure that the equipment will not operate. List all controls that need to be tested and all indicators that should be observed to ensure the equipment has been isolated from all energy sources. "**CAUTION**" ensure all controls have been returned to the off or neutral position upon completion of the test.

Use Multi-meter to verify that no voltage is present.

7. Jogging or Cycling

If, during repair or maintenance activities, the machine or equipment is required to be jogged or cycled list the location of lockout/tagout device(s) is removed to accomplish this. Only the lockout/tagout devices absolutely necessary to allow the equipment or machine to be jogged or cycled should be removed. After the equipment or machine has been cycled or jogged the lockout/tagout devices shall be reapplied and steps two through six shall be repeated prior to commencing work.

N/A

8. Release from Lockout/Tagout and Restoring to Service

Before lockout/tagout devices are removed and energy is restored to the machine or equipment, inspect the area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

- Check the work area to ensure that all employees are clear of the equipment or machine.
- Verify that all controls are in their neutral or off position.
- Each lockout/tagout device shall be removed from each energy isolation device by the employee who applied the device.
- Notify all affected employees that the lockout/tagout devices have been removed and the machine or equipment is safe for use.

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ATTACHMENT D-12
Lockout/Tagout Procedure

Equipment: UPS and Battery Backup

Location: WFO Springfield, MO

NOTE: Special precautions outlined in paragraph 9 of this Attachment should be followed.

1. Make Notifications

Notify affected employees that a lockout is required, the reason for the lockout, and the expected duration. List the Name(s) of affected employees and how to notify them.

- | |
|---|
| <ol style="list-style-type: none">1. Electronics Systems Analysts2. Meteorologist in Charge3. Lead Forecaster |
|---|

2. Machine or Equipment Isolation

Determine all sources of energy feeding into the machine or equipment and the location of the isolation device needed to isolate the machine or equipment from the energy source. List the location of all energy sources and the sequence in which they need to be isolated. **Note:** The Equipment Manuals and Operations and Maintenance Manuals for the specific piece of equipment should provide the location and type of energy sources feeding into the equipment.

1. AC Power: Panel MDPP Circuit 3 (AKA UPS Input Breaker (Q10)).

Note: For continued power supply to the site, while the UPS is off line switch UPS to MDPP.

2. Static Discharge: SBS Input Breaker
3. DC Power: Battery Breaker (Q1).
4. Primary Capacitors on Main Line
5. Secondary Capacitors near

3. Shutdown Equipment

Provide the appropriate procedure to shut down the equipment.

1. Turn SBS Mode Selector to MAINS operation. LED 5 illuminate and LED 11 goes out.
2. Place Mechanical Bypass Switch in bypass position (1) LED 1 illuminates and LED 5 goes out.
3. Press Inverter On/Off (17) key on the Display Panel followed within 2 seconds, by the Enter Key (18).
4. Turn Rectifier Mode and SBS Mode Selectors to OFF.
5. Open UPS Input Breaker (Q51) and Battery Breaker (Q1). UPS is now shut down. Place external maintenance bypass in bypass position.
6. Manually discharge the Primary Capacitors.
7. Manually discharge the Secondary Capacitors.

4. Lockout or Tagout Device Application

List the location of all lockout devices. If a lockout device cannot be applied list the location of the tagout device and any additional precautions taken to ensure the level of safety is equal to that of a lockout device.

1. Open Panel MDPP Circuit 3 (AKA UPS Input Breaker (Q10)) and lockout/tagout.

Note: For continued power supply to PPC, while the UPS is off line switch UPS to MDPP.

2. Open SBS Input Breaker and lockout/tagout
3. Open Battery Breaker (Q1) and lockout/tagout.
4. Manually discharge the Primary Capacitors, Ground and Tagout.
5. Manually discharge the Secondary Capacitors, Ground and Tagout.

5. Release Stored Energy

List any devices that may contain stored energy and the process to safely release or contain this energy. Examples include, but are not limited to, capacitors, springs, hydraulic cylinders, and pressurized piping.

1. DC battery power supply needs to be isolated by lockout/tagout of Battery Breaker (Q1)
2. Batteries should be removed rather than discharged. This involves Live Electrical Work. Caution: Batteries carry 375 volts. To remove batteries, isolate racks then each shelf and then each pair until finally the individual batteries remain.

6. Verification of Isolation

To ensure that all energy sources have been isolated, ensure that no personnel can be exposed to operating machinery or equipment, operate all controls to ensure that the equipment will not operate. List all controls that need to be tested and all indicators that should be observed to ensure the equipment has been isolated from all energy sources. **“CAUTION”** ensure all controls have been returned to the off or neutral position upon completion of the test.

Use Multi-meter to verify that no voltage is present.

7. Jogging or Cycling

If, during repair or maintenance activities, the machine or equipment is required to be jogged or cycled list the location of lockout/tagout device(s) is removed to accomplish this. Only the

lockout/tagout devices absolutely necessary to allow the equipment or machine to be jogged or cycled should be removed. After the equipment or machine has been cycled or jogged the lockout/tagout devices shall be reapplied and steps two through six shall be repeated prior to commencing work.

N/A

8. Release from Lockout/Tagout and Restoring to Service

Before lockout/tagout devices are removed and energy is restored to the machine or equipment, inspect the area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

- Check the work area to ensure that all employees are clear of the equipment or machine.
- Verify that all controls are in their neutral or off position.
- Each lockout/tagout device shall be removed from each energy isolation device by the employee who applied the device.
- Notify all affected employees that the lockout/tagout devices have been removed and the machine or equipment is safe for use.

9. Special Precaution for UPS Battery Replacement

The following special precautions should be followed:

5. Two person crew should do the work.
6. Rubber electrical safety gloves and chemical resistant safety goggles or safety glasses with chemical resistant face shields shall be worn.
7. Follow all lockout/tagout procedures prior to battery removal.

8. There are multiple rows of UPS model specific batteries that cannot be turned off. Voltage across the +/- terminals is 375 volts D.C. The order of isolation for these batteries are as follows:
 - (1) Racks
 - (2) Shelves
 - (3) Pairs
9. Damaged batteries should be placed in special container and disposed of properly.
10. Reverse these directions to install new batteries.

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ATTACHMENT D-13

Lockout/Tagout Procedure

Equipment: Changing Batteries in the UPS Battery Backup

Location: WFO Springfield, MO

NOTE: Special precautions outlined in paragraph 9 of this Attachment should be followed.

1. Make Notifications

Notify affected employees that a lockout is required, the reason for the lockout, and the expected duration. List the Name(s) of affected employees and how to notify them.

1. Electronics Systems Analysts
2. Meteorologist in Charge
3. Lead Forecaster

2. Machine or Equipment Isolation

Determine all sources of energy feeding into the machine or equipment and the location of the isolation device needed to isolate the machine or equipment from the energy source. List the location of all energy sources and the sequence in which they need to be isolated. **Note:** The Equipment Manuals and Operations and Maintenance Manuals for the specific piece of equipment should provide the location and type of energy sources feeding into the equipment.

1. AC Power: Panel MDPP Circuit 3 (AKA UPS Input Breaker (Q10)).

Note: For continued power supply to the site, while the UPS is off line switch UPS to MDPP.

2. Static Discharge: SBS Input Breaker
3. DC Power: Battery Breaker (Q1).
4. Primary Capacitors on Main Line
5. Secondary Capacitors near.
6. Battery Rack

3. Shutdown Equipment

Provide the appropriate procedure to shut down the equipment.

1. Turn SBS Mode Selector to MAINS operation. LED 5 illuminate and LED 11 goes out.
2. Place Mechanical Bypass Switch in bypass position (1) LED 1 illuminates and LED 5 goes out.
3. Press Inverter On/Off (17) key on the Display Panel followed within 2 seconds, by the Enter Key (18).
4. Turn Rectifier Mode and SBS Mode Selectors to OFF.
5. Open UPS Input Breaker (Q51) and Battery Breaker (Q1). UPS is now shut down. Place external maintenance bypass in bypass position.
6. Manually discharge the Primary Capacitors.
7. Manually discharge the Secondary Capacitors.
8. Batteries removal is Hot-Work. Follow precautions for Live Electrical Work. Caution: Batteries carry 375 volts. To remove batteries, isolate racks then each shelf and then each pair until finally the individual batteries remain.

4. Lockout or Tagout Device Application

List the location of all lockout devices. If a lockout device cannot be applied list the location of the tagout device and any additional precautions taken to ensure the level of safety is equal to that of a lockout device.

1. Open Panel MDPP Circuit 3 (AKA UPS Input Breaker (Q10)) and lockout/tagout.
Note: For continued power supply to PPC, while the UPS is off line switch UPS to MDPP.
2. Open SBS Input Breaker and lockout/tagout
3. Open Battery Breaker (Q1) and lockout/tagout.
4. Manually discharge the Primary Capacitors, Ground and Tagout.
5. Manually discharge the Secondary Capacitors, Ground and Tagout.

5. Release Stored Energy

List any devices that may contain stored energy and the process to safely release or contain this energy. Examples include, but are not limited to, capacitors, springs, hydraulic cylinders, and pressurized piping.

1. DC battery power supply needs to be isolated by lockout/tagout of Battery Breaker (Q1)
2. Batteries should be removed rather than discharged. This involves Live Electrical Work. Caution: Batteries carry 375 volts. To remove batteries, isolate racks then each shelf and then each pair until finally the individual batteries remain.

6. Verification of Isolation

To ensure that all energy sources have been isolated, ensure that no personnel can be exposed to operating machinery or equipment, operate all controls to ensure that the equipment will not operate. List all controls that need to be tested and all indicators that should be observed to ensure the equipment has been isolated from all energy sources. **CAUTION** ensure all controls have been returned to the off or neutral position upon completion of the test.

Use Multi-meter to verify that no voltage is present.

7. Jogging or Cycling

If, during repair or maintenance activities, the machine or equipment is required to be jogged or cycled list the location of lockout/tagout device(s) is removed to accomplish this. Only the lockout/tagout devices absolutely necessary to allow the equipment or machine to be jogged or cycled should be removed. After the equipment or machine has been cycled or jogged the lockout/tagout devices shall be reapplied and steps two through six shall be repeated prior to commencing work.

N/A

8. Release from Lockout/Tagout and Restoring to Service

Before lockout/tagout devices are removed and energy is restored to the machine or equipment, inspect the area to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

- Check the work area to ensure that all employees are clear of the equipment or machine.
- Verify that all controls are in their neutral or off position.
- Each lockout/tagout device shall be removed from each energy isolation device by the employee who applied the device.
- Notify all affected employees that the lockout/tagout devices have been removed and the machine or equipment is safe for use.

9. Special Precaution for UPS Battery Replacement

The following special precautions should be followed:

- Two person crew should do the work.

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- Rubber electrical safety gloves and chemical resistant safety goggles or safety glasses with chemical resistant face shields shall be worn.
- Follow all lockout/tagout procedures prior to battery removal.
- There are multiple rows of UPS model specific batteries that cannot be turned off. Voltage across the +/- terminals is 375 volts D.C. The order of isolation for these batteries are as follows:
 - (1) Racks
 - (2) Shelves
 - (3) Pairs
- Damaged batteries should be placed in special container and disposed of properly.
- Reverse these directions to install new batteries.